PATENT
Docket No. 261922003302

AF
1649
GP1649
#17
1/3
1/10/00

CERTIFICATE OF HAND DELIVERY

I hereby certify that this correspondence is being hand filed with the United States Patent and Trademark Office in Washington, D.C. on December 28 1999.

LaVerne Whetstone

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In the application of:

Albert J.J. Van Ooyen

Serial No.: 09/003,047

Filing Date: January 5, 1998

For: TRANSGENIC PLANTS HAVING A MODIFIED CARBOHYDRATE CONTENT

Examiner: Zaghmount, O.

Group Art Unit: 1649

BRIEF ON APPEAL

Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

This is an Appeal from the final rejection of claims 1, 27, 28, 36, 39, 42, 48, 51 and 54-58 in the above-referenced application. In accordance with 37 C.F.R. § 1.192, this Brief, along with the Appendix, is filed in triplicate and is accompanied by the required fee.

I. Real Party in Interest

The recorded assignment in our records is to Mogen International, N.V.(Assignment Recorded July 16, 1997, Reel 8596, Frame 0866).

II. Related Appeals and Interferences

None known.

III. Status of Claims

Claims 1, 27, 28, 36, 39, 42, 48, 51 and 54-58 are pending in the application and are at issue in this appeal. All these claims stand rejected by the Examiner.

IV. Status of Amendments

A Rule 116 Amendment was filed on August 17, 1999 and entered. The outstanding rejection based on 35 USC § 112, first paragraph, was maintained. Claim 1 was amended to clearly indicate the location of the carbohydrate material targeted by the leader sequence as being a cellular organelle or cellular compartment. Claim 56 was amended to specify that the plant contains a stably integrated gene encoding a microbial endo-glucanase, introduced by the claimed expression cassette. Claim 58 was amended to specify that the modified carbohydrate material as being contained in a cellular organelle or cellular compartment.

V. Summary of Inventions

The disclosed and claimed invention is directed to a sophisticated and more predictable method for obtaining plants or plant organs with an microbial endo-glucanase(s) modified carbohydrate content. Prior art methods, upon which the instant invention is an improvement, are described in the Background section of the application starting at line 11 on page 2. The method involves growing a transgenic plant or organ under conditions that result in the expression of the microbial glucanase, its transport to the carbohydrate material to be modified and its action on the carbohydrate.

Additionally, the claims are directed to a recombinant expression construct encoding a microbial endo-glucanase operably linked to a regulatory or leader sequence, and transformed hosts, a transgenic plant or bacteria. The regulatory sequence directs expression of said enzyme-encoding nucleotide sequence at a selected stage of development or maturity of the transgenic plant or plant organ, comprises a 35S CaMV promoter, or directs tissue-specific expression of said enzyme-encoding nucleotide sequence in a plant. The leader sequence targets the expressed endo-glucanase to the carbohydrate material in a desired compartment or organelle.

Also, a stably transformed, transgenic plant or plant organ having a cellular compartment or organelle containing a microbial endo-glucanase modified carbohydrate composition made by the claimed process is claimed.

VI. Issue(s)

Whether claims 1, 27, 28, 36, 39, 42, 48, 51 and 54-58 are patentable under 35 USC 112, first paragraph, as based on a specification which is sufficient to permit those skilled in the art to practice the invention commensurate in scope with the claims without the exercise of undue experimentation?

VII. Grouping of Claims

Claims 1, 27, 28, 36, 39, 42, 48, 51 and 56 should stand or fall together. Claims 54, 55 and 57 should stand or fall together. The first group of claims is directed to a method of modifying the carbohydrate material of a transgenic plant or plant organ and the plant resulting from the process. The method involves the growth of the transgenic plant and the expression of a microbial endoglucanase(s). The second group of claims is directed to the reagents used in the method, e.g. a recombinant DNA expression cassette containing the gene encoding the microbial endo-glucanase operably linked to one of three specific types of regulatory sequences and the products containing the cassette, e.g. a vector, a bacterial host and transgenic plant host.

VIII. Argument

The appeal claims are similar to those in U.S. Patent No. 5,705,375, the parent of the instant application. A distinguishing claim feature of the patent claims is the limitation to microbial α-amylase. The Examiner, here, is of the opinion that the scope of the patent claims is enabled. The issue appears to be whether the teachings provided within the instant specification, which are the same as the patent, are sufficient to permit the practice of the claimed invention in terms of the use of a microbial endo-glucanase.

The Examiner asserts that undue experimentation would be required to practice the invention as claimed due to the unpredictability of the processes involved. This unpredictability has not been established. It is merely alleged.

It is respectfully submitted that a proper prima facie case has not been established.

It is not clear from the record as to why the teachings provided within the specification are insufficient taken alone or in conjunction with the conventional knowledge in the art at the time the earliest parent patent application was filed.

The interaction of glucanase with starch or other plant carbohydrates to form various hydrolyzates is not novel nor is the use of related glucanase pairs to form specific types of glucan hydrolyzates (note class 435/94+). What the disclosed invention and the claims are directed to is the formation of modified plant carbohydrates (hydrolyzates) in cellular compartments and/or organelles. How this is to be done is taught in the specification.

Representative glucanase are set forth on page 6, starting at line 20. Useful targeting leader sequences are set forth starting at line 25 on page 10. Useful regulatory sequences are set forth starting on line 24 of page 9. Suitable plants are illustrated on page 8 starting at line 25.

The examples, especially Examples 3-5, 7-8, and 11-12 illustrate the operation of the invention in a variety of plants, e g. potato, tomato, tobacco, using various approaches, e.g. agrobacterium, tuber-specific expression construct, and enzymatic modification of carbohydrates at various sites, e.g. leaves, roots and fruit. The specific types of glucanase used is not critical. Their selection is based on the desired end. The known carbohydrase action patterns(s) would

aid in the specific selection as would the degree and type branching present in the carbohydrate material. These are the type of selections which would involve at best routine experimentation.

The delivery of the enzymes to a desired site merely involves the selection of a known regulatory element or targeting leader. The elements for doing this are known. The specification, especially the examples, illustrate the operation of the invention. Following, these teachings using conventional materials is not seen to involve undue experimentation, especially as to the claims as amended. The stated object is merely to modify carbohydrate composition of the plant. This does not necessarily require the maintenance of a trait. The nature of the modification, e.g. presence of oligo- and/or monosaccharides, is described as is its monitoring using conventional assays.

The Examiner's main objection appears to be that expression of the genes to obtain desired plant phenotypes is unpredictable. The Examiner further argues that the instant disclosure fails to teach the factors which are essential for successfully expressing a glucanase gene of microbial origin. The Examiner assumes that the expression of nonplant genes in plants always requires modifications of the microbial coding sequence. Applicants have shown in the specification that for the expression of two microbial enzymes, α-amylase and glucoamylase, no modification of the coding sequence was needed (see Example 2 and Example 9). The claims are limited to microbial endoglucanases and successful events.

The Examiner maintains that the specification "does not reasonably provide enablement for all methods of modifying carbohydrate of any transgenic plants that express any DNA sequence of any primary enzyme of interest capable of degrading polysaccharides." However, enablement for all methods of modifying carbohydrates is not necessary as the application does not concern all methods of modification, but simply the method covered by claim 1. Similarly, claim 1 concerns a microbial endoglucanase and not, as suggested by the Examiner, any primary enzyme capable of degrading polysaccharides.

Modification of the microbial endo-glucanases to form variants ("muteins") or the nucleotide sequences that encode Variants is not required by the claims. Further, where modification of a coding sequence may be required, standard techniques would be employed which are well known to those skilled in the relevant art. The invention here does not reside in the discovery of such modifications. Applicants acknowledge that genes of microbial origin that

require modification of the coding sequence exist, but many genes of microbial origin do not require such modification for efficient plant expression, such genes being readily apparent to persons skilled in the art. Therefore, predictability cannot be said to be at a level that would necessitate undue experimentation. Appellants again remind the Examiner that the present application details two examples (Example 2 and Example 9) which illustrate that the expression of two microbial enzymes, α-amylase and glucoamylase, does not require modification of the coding sequence.

Appellants also disagree with the suggestion that obtaining a transgenic plant with a desirable "phenotype" is unpredictable. The transforming of plants with genes of microbial origin render the process of obtaining a desirable trait more predictable than the transforming of plants with plant-derived genes. This issue of unpredictability is therefore only applicable to the transforming of plants with plant-derived genes. The unpredictability is due to the close relationship of the plant from which the gene was obtained and the plant into which the gene has been transformed. Interference with the endogenous gene already present in the host plant can therefore be expected. This apparently is not the case when using microbial genes.

Applicants have further demonstrated that methods for introducing a transgene into a cassava plant and the subsequent regeneration of cassava plants from the transformed cassava plant cells were known in the art at the time of the present invention. Such methods could be used in the present invention without undue experimentation.

Napoli *et al.* and Carvalho *et al* publications, previously relied upon by the Examiner, are not concerned with microbial source genes. Rather, the publications are concerned with the use of plant-derived genes for transformation to plants within the same genus or even the same species. Given the close relationship of the plant from which the gene was obtained and the plant into which the gene has been transformed, it could be expected that there is interference with the endogenous gene already present in the host plant. This problem is much less present when a microbial gene is used, for, even if a functional homologous gene is present in the home plant. The microbial gene differs significantly from any endogenous gene.

The examples, especially Examples 3-5, 7-8, and 11-12 illustrate the operation of the invention in a variety of plants, e g. potato, tomato, tobacco, using various approaches, e.g. agrobacterium, tuber-specific expression construct, and enzymatic modification of carbohydrates

at various sites, e.g. leaves, roots and fruit. The specific types of glucanase used is not critical. Their selection is based on the desired end. The known carbohydrase action patterns(s) would aid in the specific selection as would the degree and type branching present in the carbohydrate material. These are the type of selections which would involve at best routine experimentation. The delivery of the enzymes to a desired site merely involves the selection of a known regulatory element or targeting leader. The elements for doing this are known. The specification, especially the examples, illustrate the operation of the invention. Following, these teachings using conventional materials is not seen to involve undue experimentation, especially as to the claims as amended. The stated object is merely to modify carbohydrate composition of the plant. This does not necessarily require the maintenance of a trait. The nature of the modification, e.g. presence of oligo- and/or monosaccharides, is described as is its monitoring using conventional assays.

The guidance for practicing the invention as claimed is set forth within the specification. There is no evidence of record that would suggest that any experimentation that may be required would be considered undue by one skilled in the art.

For the reasons, supra, reversal of the rejection is believed to be in order since a proper prima facie case has not been established. This reversal is respectfully requested.

The Assistant Commissioner is hereby authorized to charge any additional fees under 37 C.F.R. § 1.17 that may be required by this Brief, or to credit any overpayment, to Deposit Account No. 03-1952.

Respectfully submitted,

Dated: December 28, 1999 By: _____

Thomas G. Wiseman
Registration No. 35,046

Morrison & Foerster LLP
2000 Pennsylvania Avenue, N.W.
Washington, D.C. 20006-1888
Telephone: (202) 887-1678
Facsimile: (202) 887-0763

Attached: Appendix A
(copy of claims involved in the Appeal)